REMARKS

Claims 7 and 9-18 are pending in this application. By this Amendment, claims 10, 11 and 13 are amended, claim 8 is canceled, and new claims 17 and 18 are added. Support for the amendments to the claims and added claims may be found in the specification, for example, on page 1, lines 19-24, page 4, lines 34-37, and page 5, lines 31-34. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

I. Rejection Under 35 U.S.C. §112

The Office Action rejects claims 7-16 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. By this Amendment, claim 8 is canceled, thereby rendering its rejection moot. As to the remaining claims, the rejection is respectfully traversed.

By this Amendment, claim 10 is amended to recite "sheet steel" instead of "a sheet metal," and to clarify that the evaporator tube is produced by welding sheet steel in the form of a tube. No separate grounds are identified for the rejection of claims 7, 9 and 11-16. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. Rejection Under 35 U.S.C. §103

The Office Action rejects claims 7-16 under 35 U.S.C. §103(a) as allegedly having been obvious over Ohara, or over Ohara in view of EP 0 683 421 ("Park"). By this Amendment, claim 8 is canceled, thereby rendering its rejection moot. As to the remaining claims, the rejection is respectfully traversed.

A. Ohara Would Not Have Rendered The Claimed Invention Obvious

Independent claim 7 recites:

> An evaporator tube for a sea water desalination system, which is formed of a steel that is sea water resistant and at the same time acid resistant, and which has a wall thickness between 0.1 mm and 0.5 mm.

The combination of features recited in independent claim 7 would not have been rendered obvious by Ohara alone because Ohara fails to teach or suggest: "an evaporator tube for a sea water desalination system," much less such a device made of the recited steel with the recited thickness, as recited by claim 7. Instead, Ohara describes a "flat tube for a heat exchanger, such as in evaporator of an air conditioner for automobiles" made of a "high heat conductivity material such as aluminum alloy containing a small amount of manganese and copper." See column 1, lines 11-13 and column 2, lines 50-53. Ohara fails to describe steel or a material with low heat conductivity, such as steel. Thus, Ohara fails to describe "formed of a steel," as recited in claim 7. Additionally, because Ohara's product is for use in an evaporator of an air conditioner for automobiles, it does not provide any reason to modify its disclosure to produce an evaporator tube for a sea water desalination system, much less one formed of the specified steel in the specified thickness.

Therefore, independent claim 7, and the claims dependent therefrom, would not have been rendered obvious by Ohara alone. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Ohara And Park Would Not Have Rendered The Claimed Invention Obvious

Independent claim 7 would not have been rendered obvious by the applied references because the claimed invention was contrary to accepted wisdom to one of ordinary skill in the art at the time of the invention, there would have been no reason to combine the applied

references, and even the improper combination would not have produced the claimed invention.

1. **Scope And Content Of The Art And Level Of Skill In The Art**

The claimed steel evaporator tube is used in sea water desalination by distillation, wherein a plurality of evaporator tubes is employed for evaporating sea water and for recovering the evaporation energy. See page 1, lines 13-15 of the present specification. First, a sea water film is applied to a first outer or inner side of the tube. See page 1, lines 19-24 of the present specification. The steam generated from the evaporation is conducted to the other side of the tube, where the steam condenses under a higher pressure and higher temperature. *Id.* The released condensation heat is conducted through the tube wall to the first side of the tube, thereby resulting in the evaporation of sea water from the film of sea water. *Id.*

Accordingly, it was understood in the art that the material used for producing the evaporator tubes must have high heat conductivity and be corrosion-resistant. Corrosion is particularly a bigger concern for intermittently operated wind-powered sea water desalination systems (as compared to stationarily run systems) because the risk of scale formation on the evaporator tubes is substantially higher. See page 2, lines 17-28 of the present specification. Scale formation in the tubes causes considerable reduction in heat conductivity. *Id.* This problem can be prevented by adding acid to the tubes prior to the evaporation of the sea water. *Id.* However, this necessitates that the evaporator tubes exhibit acid corrosion-resistance.

Because it was understood that using a material with a good heat transmission factor in producing the evaporator tubes is critical, conventional evaporator tubes were made from materials with high heat conductivity, such as aluminum alloys and alloys of copper, nickel and iron. In comparison, steel has very low heat conductivity, and therefore, one of ordinary

skill in the art at the time of the invention would not have selected steel as the material for evaporator tubes.

Ohara does not even address evaporator tubes for a sea water desalination system. Instead, it is directed to a "flat tube for a heat exchanger, such as in evaporator of an air conditioner for vehicles." Column 1, lines 10-12. Thus, Ohara does not provide any teachings regarding the specific requirements of an evaporator tube for a water desalination system.

Nevertheless, Ohara teaches, as also was the contemporary wisdom in the water desalination evaporator tube art, that its automobile air conditioner evaporator tubes should be "made of a high heat conductivity material such as aluminum alloy containing a small amount of manganese and copper." Column 2, lines 50-53. In addition, Ohara teaches that "when the condensers are made with the present invention, it is preferable to use pure aluminum for the flat tube." Column 4, lines 34-36.

Park is directed to stainless steel compositions suitable for use in chloride-ion containing environments. Paragraph [0009]. Park discloses that the subject alloys are "suitable for use in the areas of heat exchangers using sea water as cooling water, tanks and pipes of desalination plants." Paragraph [0001]. However, Park does not disclose that its composition can be used in evaporator tubes for a sea water desalination system. Furthermore, the minimum sheet thickness of steel disclosed in Park is 1 mm. Paragraphs [0031], [0039], [0057] and [0068].

2. <u>The Claimed Invention</u>

The Applicant has surprisingly discovered that the heat transfer between the distillate steam and sea water film at the *surfaces* of the evaporator tubes is of a substantially greater importance than heat conduction *through* the tube wall (see page 3, lines 11-15). This unexpected discovery allowed steel to be considered as a suitable material for use in

producing evaporator tubes, contrary to the teachings of Ohara. Moreover, the Applicant also discovered that because steel exhibits high corrosion resistance, the thickness of the steel tube walls could be decreased to improve heat conductivity without compromising the corrosion resistance. Therefore, the claimed invention is based on the Applicant's insights that: 1) heat transfer at the tube surface is a more important factor than heat conduction through the tube wall; 2) contrary to accepted wisdom, it is possible to use steel, a material with low heat conductivity, to produce evaporator tubes; and 3) reducing the wall thickness of the evaporator tubes to less than a conventional thickness can remedy the low heat conductivity of the steel while still achieving corrosion resistance.

3. The Recited Combination Would Have Been Contrary To Accepted Wisdom

One of ordinary skill in the art at the time of the invention would not have selected steel, a relatively low heat-conductivity material (specification, page 3), as the material to form sea water desalination evaporator. In fact, to the extent Ohara is relevant at all, it would have taught away from substituting steel for its aluminum materials by its express teaching to use "a high heat conductivity material such as aluminum alloy" or "pure aluminum." Park provides no contrary teaching, as it does not address sea water desalination evaporator tubes at all, much less steel tubes having a wall thickness between 0.1 mm and 0.5 mm. To the contrary, for the uses disclosed in Park, Park teaches a minimum thickness of 1 mm. Thus, the recited combination would have been contrary to accepted wisdom. Therefore, the applied references would not have rendered independent claim 7 and the claims dependent therefrom obvious. The totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. *See* MPEP §2145, citing *In re Hedges*, 783 F.2d 1038 (Fed. Cir. 1986).

The Applicant has discovered for the first time, contrary to the accepted wisdom that "steel is not suited as a material for evaporator tubes in sea water desalination systems," that steel may, in fact, be used as a material for evaporator tubes. See specification page 3, lines 5-7. Accordingly, the claimed invention is contrary to the accepted wisdom to one of ordinary skill in the art at the time of the invention.

Moreover, it would also have been contrary to accepted wisdom at the time of the invention to have produced sea water desalination evaporator tubes having a wall thickness from 0.3 mm to 0.4 mm. The present specification on page 1, line 26 to page 2, line 2, describes the accepted wisdom in the art at the time of the invention was that "[d]ue to the operating conditions, [conventional] evaporator tubes in all [sea water desalination systems]...usually have a wall thickness of 2 mm." However, as further described in the present specification on page 3, lines 10-13, Applicant "realized that it is nevertheless possible to use such a steel while clearly reducing the previously provided wall thicknesses of at least 2 mm without substantially impairing the stability of the [tube] arrangement." For this reason also, the claimed invention is contrary to accepted wisdom in the art. Therefore, Ohara and Park would not have rendered independent claim 7 and the claims dependent therefrom obvious.

4. There Would Have Been No Reason To Combine The Applied eferences

There would have been no reason for one of ordinary skill in the art at the time of the invention to combine the applied references. As discussed above, Ohara describes an "evaporator of an air conditioner for automobiles" made of materials with high heat conductivity, while Park describes "heat exchangers using seawater as *cooling* water, tanks and pipes of desalination plants" made from 1 mm or more thick steel, a low heat conductivity material (emphasis added). Accordingly, there would have been no reason for

one of ordinary skill in the art at the time of the invention to have combined the applied references.

5. The Combined References Would Not Have Produced The Claimed Invention

The combined references would not have produced the claimed invention. Claim 7 recites, in part, "an evaporator tube for a sea water desalination system." However, as described above, Ohara fails to teach or suggest at least this limitation, and Park fails to cure this deficiency of Ohara. At most, Park teaches "heat exchangers using seawater as *cooling* water, tanks and pipes of desalination plants" (emphasis added). See paragraph [0001]. However, claim 7 specifically requires that the tubes are evaporator tubes, not merely heat exchangers, tanks or pipes as described by Park. In this regard, it is noted that neither Ohara nor Park disclose a system in which sea water is treated in the evaporator tubes. Accordingly, even the improper combination of the applied references would not have produced the claimed invention.

For this reason also, the applied references, alone or in combination, would not have rendered independent claim 7 and the claims dependent therefrom obvious. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of this application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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JAO:HHS/jth

Attachment:
Petition for Extension of Time

Date: June 27, 2008

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